DEVELOPING AND VALIDATING RESERVOIR PRESSURE MANAGEMENT AND PLUME CONTROL STRATEGIES IN THE WILLISTON BASIN THROUGH A BRINE EXTRACTION AND STORAGE TEST (BEST)

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PRESENTATION SUMMARY

Active formation pressure and plume management are important tools which can be used to enhance carbon dioxide (CO_2) injection and storage operations in the Williston Basin and elsewhere. The Energy & Environmental Research Center is conducting a Phase 1 project to develop innovative approaches for managing formation pressure and monitoring and managing differential pressure fronts and CO_2 plumes occurring during storage in saline aquifers. The project will also assess the viability of several pilot-ready water treatment technologies for the treatment of extracted water and design along with a surface facility design for hosting water treatment technology demonstrations. Site selection and approach validation will be based on detailed reservoir modeling and simulation efforts. Specifically, the project will create a technical design package for a brine extraction and storage test (BEST) focused on validating approaches for active reservoir management (ARM) and extracted-water treatment at a selected location.

ABSTRACT

An Energy & Environmental Research Center (EERC) project was initiated in mid-2015 to examine the issues and solutions related to active reservoir pressure and plume management for enhancing carbon dioxide (CO_2) storage operations. This effort, funded by the U.S. Department of Energy with partnership from General Electric, Schlumberger, and Computer Modelling Group, is intended to develop innovative approaches to managing formation pressure and monitoring and managing differential pressure fronts and CO_2 plumes occurring during saline aquifer storage. Specifically, the project will create a technical design package for a brine extraction and storage test (BEST) focused on validating approaches for active reservoir management (ARM) and extracted-water treatment. The results of this project will also provide insight for pressure management at future commercial carbon capture and storage (CCS) sites. The BEST project is being conducted in a two-phase approach. The initial phase (Phase I) is an effort to identify the most viable BEST pilot site within the Williston Basin based on technical, operational, and logistical criteria and to design a pilot injection test at this selected site. The second phase (Phase II) is subject to a downselection process and will entail conducting a field demonstration effort at the selected site. The Phase I site selection process is giving consideration to target water salinity, potential water extraction rates, and the site's potential for the commercial storage of CO_2. Much of the project's site selection and design activity will be based on detailed reservoir modeling and simulation efforts. Following site selection, a BEST

and associated monitoring plan will be developed based on site characterization, geologic modeling, and reservoir simulation results. Phase II of the project, if awarded and implemented, will then utilize the plan developed in Phase I to conduct a field validation effort.

A second component of the Phase I effort is to study the viability of several pilot-ready water treatment technologies for their potential to be deployed at the Phase II demonstration site as extracted-water management strategies. Surface facilities will be designed in Phase I to be flexible and modular for potentially demonstrating a variety of pilot-ready water treatment technologies. Engineering design, water life cycle analysis, cost specification, permitting plan development, and cost/benefit analysis will be carried out for the combined surface and subsurface components. Logistical criteria (e.g., pore space ownership, water rights, liability, and site access agreements) will be discussed in the permitting plan. A site-monitoring plan will be developed to both help observe the ARM process and demonstrate viable techniques for monitoring a CO_2 storage project with ARM. The Phase II portion of the project, if awarded, will consist of a 48-month effort that will carry out the BEST plan developed during Phase I, including installation and operation of the facilities that would serve as a test bed for ARM and extracted-water management strategies.